

NOTES FOR GEORGIA TECH PRESIDENT G. WAYNE CLOUGH
“Federal Science, Education, and Technology Policy Symposium”
Southeast Regional Meeting of the American Chemical Society, November 17, 2003

- Over past half-century, research and innovation in science and technology have become source of U.S.’s economic and military leadership. Economic well-being, national security, energy provision all depend on ability to discover new knowledge, develop new technology.
- The challenge of Nikita Krushchev brought the importance of research in science and technology to the fore and launched the present era of federal investment in university research.
 - Early federal funding focused on defense.
 - Had spillover into the general economy, with benefits still evident today (semiconductors, Internet).
 - Demonstrated the valuable contribution of basic research at universities to driving the economy.
- 3 important characteristics to bear in mind:
 - Timeframe from fundamental research until commercial applications hit the market can be long and sometimes take unexpected turns. (Richard Feynman, 1959, probably did not envision Eddie Bauer nano-engineered Chino pants).
 - Ergo, industry focuses on the application end of the process. Federally funded research at universities is the largest provider of the fundamental research on which industry efforts are based – the seed corn that will provide the prosperity of future generations.
 - Science/technology research is increasingly interdisciplinary – all disciplines need to move forward together.
- Federal funding needs to reflect these characteristics:
 - Stable funding over time (took 4 decades to get from Feynman lecture introducing nanotech to Eddie Bauer pants)
 - Balanced portfolio among the disciplines: chemistry is among the physical science and engineering disciplines that suffered a decline of 20% or more 1993-1999 as emphasis shifted to life sciences and doubling of NIH budget.
- Looking at the big picture:
 - Research scientists and universities tend to look at their own individual projects, and it is important to provide funding for individual projects and to allow the dynamic nature of research to drive the decisions
 - However, also need coordination of efforts to serve broader national priorities. Federal research funding spread across 15 functions in the federal budget, across about a dozen appropriation bills handled by 13 different committees
 - Importance of big-picture coordination:

- Mapping of genome: required orchestration of multiple efforts, but opened tremendous door of opportunity
 - Nanotech: \$1 billion across 10 agencies. How can we make sure those funds are being used to best effect?
 - National security / anti-terrorism
- Need for more coordination – just not more politicization, for which earmarking is sometimes a tool. (eg. PCAST nanotech oversight committee)
- Importance of technology transfer:
 - Fed gov't does not fund research out of altruism or love for science, but as investment in nation's strength and wellbeing.
 - Bayh-Dole – critical role in getting discoveries from lab to market. (Prior to Bayh-Dole: gov't retained ownership of intellectual property it funded, less than 10% of gov't intellectual property was commercialized.)
 - Commercialization of university research discoveries now generates over \$40 billion in economic activity each year
 - PCAST committee recommendations on Bayh-Dole
- Not enough to have funding; also need warm bodies to do the research:
 - Decline in # of degrees in physical sciences, math, engineering, computer science during 90s: sciences peaked in 1998, then began decline
 - International students, who had been taking up the slack, now more likely to return home after graduation, or stay home for education
 - Grad enrollments mirror research funding, decline when funding declines: As federal research funds for chemistry declined 1993-1999, graduate enrollment in chemistry declined almost 10% 1993-2000.
 - Federal fellowships have also declined: DOE, e.g., went from funding over 1,000 in 1995 to funding less than 170 in 2000; number even smaller today.
- PCAST recommendation for more federally funded fellowships.
- PCAST: opportunity for me to participate in shaping public policy. Need for more participation by scientists and engineers in political arena – we are reluctant, but much is at stake.
- Need to help elected representatives understand role of research in driving the innovation that sustains economic development, role of an educated workforce in technology-based economy.
- Increasing number of policy decisions involve or have an impact on science and technology; need for expertise from scientists and engineers is more and more apparent.
 - Not talking about engaging in partisan politics, or supporting this or that candidate, but rather providing objective expertise that gives elected officials a basis for sound decisions.
 - Personal examples:
 - PCAST at federal level

- Natural gas and telecommunications task force at state level
 - Clean Water Advisory Panel at local level
 - Need to coordinate with other organizations.
- Today, wealth not measured in land or minerals, but in knowledge and technology. Nations that are “science poor” will also be poor in economic terms. Fortunately, knowledge and discovery not limited like land and minerals. But need to make the crucial investment in research and in education.